

Spaceflight 1.94 Micron Tm Fiber Laser Transmitter, Phase II

Completed Technology Project (2017 - 2019)



Project Introduction

Fibertek will develop a spaceflight prototype 1940 nm, 100 W thulium (Tm) laser suitable for NASA spaceflight and long-duration unmanned aerial vehicle (UAV) missions. The proposal is innovative because it demonstrates 100 W of polarization maintaining (PM) performance at 1940 nm. We expect a 2x to 3x improvement in efficiency compared to available commercial off-the-shelf (COTS) unpolarized Tm fiber lasers, and the laser will be packaged for high reliability for spaceflight operation. This SBIR leverages commercial Tm laser technology, published scientific test data, available optical components, and Fibertek's validated Tm fiber laser model. A spaceflight 100 W PM Tm laser is enabling and provides a path to space for a pulsed, Q-switched 2 um Ho:YLF laser with up to 80 mJ/pulse at 100-200 Hz. Lidar performance design studies from a low earth orbit (LEO) satellite indicate that 80 mJ of pulsed 2 um energy enables the simultaneous measurements of CO₂ and water vapor using Integrated Path Differential Absorption (IPDA) and global wind light detection and ranging (lidar). NASA laser experiments have shown the 100 W of 1940 nm peak pump power is needed to generate 80 mJ/pulse.

Primary U.S. Work Locations and Key Partners

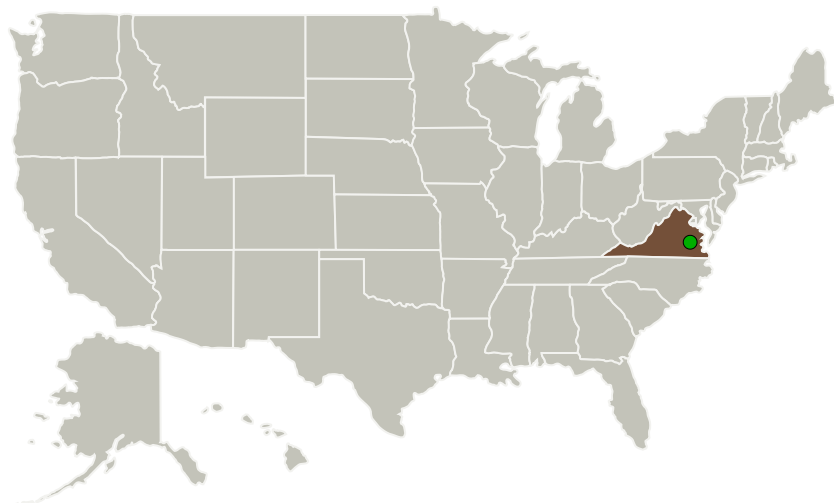


Table of Contents

Project Introduction	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	1
Project Management	1
Project Transitions	2
Images	2
Technology Maturity (TRL)	2
Technology Areas	2
Target Destinations	2

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Fibertek, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Continued on following page.

Spaceflight 1.94 Micron Tm Fiber Laser Transmitter, Phase II



Completed Technology Project (2017 - 2019)

Organizations Performing Work	Role	Type	Location
Fibertek, Inc.	Lead Organization	Industry	Herndon, Virginia
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations

Virginia

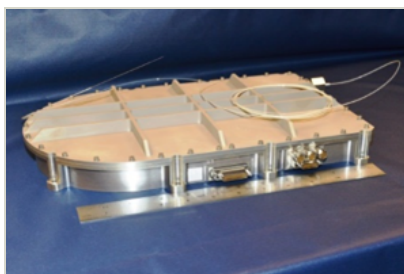
Project Transitions

**April 2017:** Project Start**September 2019:** Closed out

Closeout Documentation:

- Final Summary Chart(<https://techport.nasa.gov/file/140839>)

Images



Final Summary Chart Image

Spaceflight 1.94 Micron Tm Fiber Laser Transmitter, Phase II
(<https://techport.nasa.gov/image/133078>)

Briefing Chart Image

Spaceflight 1.94 Micron Tm Fiber Laser Transmitter, Phase II Briefing Chart Image
(<https://techport.nasa.gov/image/131732>)

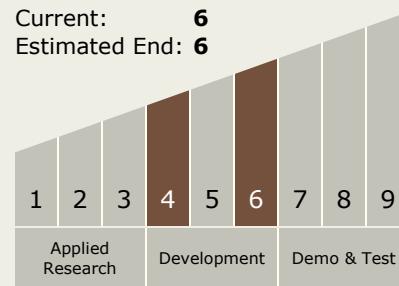
Project Management
(cont.)

Principal Investigator:

Doruk Engin

Technology Maturity
(TRL)

Start: 4
Current: 6
Estimated End: 6



Technology Areas

Primary:

- TX08 Sensors and Instruments
 - TX08.1 Remote Sensing Instruments/Sensors
 - TX08.1.5 Lasers

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System